

Amended claims

1. A security paper for producing documents of value, such as bank notes, certificates, etc., with at least one multilayer security element having at least one visually checkable optical effect, the security element being disposed at least partly on the surface of the security paper, characterized in that the security element has at least one integrated circuit.
2. A security paper according to claim 2, characterized in that the security element shows an optically variable effect whereby the security element produces different visual impressions at different viewing angles.
3. A security paper according to claim 1 or 2, characterized in that the security element has at least one layer containing optically variable pigments, in particular interference-layer or liquid-crystal pigments.
4. A security paper according to at least one of claims 1 to 3, characterized in that the security element has at least one layer in which diffraction structures in the form of a relief structure are present.
5. A security paper according to claim 4, characterized in that the diffraction structures are combined at least in certain areas with a reflecting layer, in particular a metal layer or a dielectric layer with a high refractive index.
6. A security paper according to at least one of claims 1 to 5, characterized in that the security element has at least a metallic and a dielectric layer or at least two dielectric layers with different refractive indexes, the layers cooperating so that different visual impressions arise when viewed in reflected light at different viewing angles.
7. A security paper according to at least one of claims 1 to 6, characterized in that the integrated circuit is disposed between the layers having the optical effect and the security paper.

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8. A security paper according to at least one of claims 1 to 7, characterized in that the energy supply for the integrated circuit is effected contactlessly via a coupling element.
9. A security paper according to claim 8, characterized in that the coupling element is part of the integrated circuit.
10. A security paper according to claim 8, characterized in that the coupling element is disposed in a layer of the security element.
11. A security paper according to claim 10, characterized in that the integrated circuit is connected with the coupling element.
12. A security paper according to claim 10 or 11, characterized in that the security element has at least one metallic layer in which the coupling element is formed.
13. A security paper according to claim 12, characterized in that the metallic layer is separated from the layers producing the optical effect by an insulating layer.
14. A security paper according to claim 12, characterized in that the metallic layer is at the same time one of the layers producing the optical effect.
15. A security paper according to at least one of claims 8 to 14, characterized in that the coupling element is a folded dipole, a coil or an open dipole.
16. A security paper according to claim 15, characterized in that the folded dipole or the coil has a metalized core zone.
17. A security paper according to at least one of claims 1 to 16, characterized in that the integrated circuit is a memory chip or a microprocessor chip.
18. A security paper according to at least one of claims 1 to 17, characterized in that the security element is a transfer element or a label disposed completely on the surface of the security paper.

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19. A security paper according to claim 18, characterized in that the security element has the form of a strip.
20. A security paper according to at least one of claims 1 to 17, characterized in that the security element is a security thread.
21. A security paper according to at least one of claims 8 to 19, characterized in that the coupling element occupies an area of at least 20 square millimeters.
22. A security paper according to at least one of claims 1 to 21, characterized in that the security element is so connected with the security paper that they cannot be separated nondestructively.
23. A document of value with at least one multilayer security element having at least one visually checkable optical effect, the security element being disposed completely on the surface of the document of value, characterized in that the security element has at least one integrated circuit.
24. A document of value according to claim 23, characterized in that the document of value is a passport, a bank note or a credit card.
25. A document of value according to claim 23 or 24, characterized in that the document of value has a security paper according to at least one of claims 1 to 22.
26. A document of value according to at least one of claims 23 to 25, characterized in that the document of value has a print, in particular an intaglio print, at least overlapping with the security element.
27. A multilayer security element for application to a document of value, the security element having at least one visually checkable optical effect, characterized in that the security element has at least one integrated circuit.

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28. A transfer material for applying a multilayer security element to a document of value, the transfer material having a carrier layer on which the layer structure of the security element is detachably prepared, and the security element having at least one visually checkable optical effect, characterized in that the layer structure of the security element has at least one integrated circuit.
29. A transfer material according to claim 28, characterized in that the transfer material has the following layer structure:
- a carrier layer,
 - at least one layer producing the optical effect, and
 - at least one integrated circuit.
30. A transfer material according to claim 29, characterized in that the layer producing the optical effect is a printed layer containing optically variable pigments, in particular interference-layer or liquid-crystal pigments.
31. A transfer material according to at least one of claims 28 to 30, characterized in that the transfer material has the following layer structure:
- a carrier layer,
 - a layer in which diffraction structures in the form of a relief structure are present,
 - a metal layer in which a coupling element is formed,
 - an integrated circuit, and
 - a hot-melt adhesive layer.
32. A transfer material according to at least one of claims 28 to 30, characterized in that the transfer material has the following layer structure:
- a carrier layer,
 - a layer in which diffraction structures in the form of a relief structure are present,
 - a reflecting layer permitting the diffraction structures to be observed in reflected light,

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- an insulating layer,
 - a metal layer in which a coupling element is formed,
 - an integrated circuit, and
 - a hot-melt adhesive layer.
33. A transfer material according to claim 31 or 32, characterized in that the integrated circuit is connected with the coupling element via a conductive adhesive layer.
34. A transfer material according to claim 33, characterized in that the conductive adhesive layer is a conductive silver layer or an anisotropic conductive adhesive layer.
35. A transfer material according to at least one of claims 28 to 34, characterized in that the coupling element is a folded dipole, a coil or an open dipole.
36. A transfer material according to at least one of claims 28 to 35, characterized in that the integrated circuit is a memory chip or a microprocessor chip.
37. A transfer material according to at least one of claims 29 to 34, characterized in that the transfer layer of the transfer material is formed as a non-self-supporting foil.
38. A method for producing a transfer material for applying a multilayer security element to a document of value, the transfer material having a carrier layer on which the layer structure of the security element is detachably prepared, and the security element having at least one visually checkable optical effect, characterized in that at least one integrated circuit is incorporated into the layer structure of the security element.
39. A method according to claim 38, characterized by the following steps:
- a) providing a carrier layer,
 - b) applying at least one layer producing an optical effect,

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- c) vapor-depositing a metallic layer, a coupling element being formed in the metallic layer,
 - d) applying an integrated circuit.
40. A method according to claim 39, characterized in that before step c) a soluble ink is printed on in the form of the coupling element and any further patterns or characters, and that after step c) said ink is removed together with the metallic layer.
41. A method according to claim 39 or 40, characterized in that the integrated circuit and the coupling element are interconnected via a conductive silver layer or an anisotropic conductive adhesive layer.
42. A method according to at least one of claims 39 to 41, characterized in that in step b) a layer is applied into which diffraction structures in the form of a relief structure are then embossed.
43. A method according to claim 42, characterized in that in step c) a UV-curable lacquer layer is applied that is cured during the embossing operation.
44. A method according to claim 42 or 43, characterized in that in step b) a reflecting layer is applied to the embossed layer at least in certain areas.
45. A method according to at least one of claims 39 to 41, characterized in that in step b) at least a metallic and a dielectric layer or at least two dielectric layers with different refractive indexes are applied, the layers cooperating so that different visual impressions arise when viewed in reflected light at different viewing angles.
46. A method according to at least one of claims 39 to 45, characterized in that an insulating layer is disposed between the layers producing the optical effect and the metal layer to be applied in step c).

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47. A method according to at least one of claims 39 to 45, characterized in that in a step e) an adhesive layer, preferably a hot-melt adhesive layer, is applied.
48. A method for producing a document of value with a security element, characterized in that the layer structure of the transfer material according to at least one of claims 28 to 37 is transferred to the document of value in certain areas and the carrier layer is then removed.
49. Use of the transfer material according to at least one of claims 28 to 37 for producing security elements.
50. Use of the security paper according to at least one of claims 1 to 22 for protecting products.
51. Use of the document of value according to at least one of claims 23 to 26 for protecting products.